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Note on the Range in Brightness at Maximum of Long-period Variables. By H. H. Turner, D.Sc., F.R.S., Savilian Professor.

1. In an interesting letter dated April 16, commenting upon the paper "On the Classification of Long-period Variable Stars, etc." (*Mon. Not.*, lxvii. p. 332), Mr C. L. Brook draws attention to the possibility of explaining the well-known differences between separate maxima in terms of the hypothesis put forward in the paper. His words are as follows:—

"Not only does the amount of solar disturbance vary greatly at different Sunspot maxima, but also the two hemispheres differ to a considerable extent. . . . Now if the Sun were viewed poleward instead of equatorially, the effect of this would be to further increase the difference that already exists in the intensity of the various maxima: we should either see the whole of the then more disturbed hemisphere or the whole of the less disturbed hemisphere, and not as now half (about) of each. If then the analogy between the Sun and the long-period variables holds in this particular, then the maxima of those variables which we view polewards should differ to a greater extent in intensity than the maxima of those which are viewed equatorially."

2. A rough test of the interesting corollary indicated by Mr Brook is simply made. On pages 351 and 352 of the paper above quoted are two lists of twenty stars from Chandler's Revised 3rd Catalogue which should be (on the hypothesis put forward) stars viewed polewards and stars viewed equatorially. We need only take from Chandler's 3rd Catalogue (*A.J.*, 379) his tabulated range of magnitude at maximum (not repeated in the Revision, *A.J.*, 553). Thus for X Ophiuchi (No. 6682), Chandler gives the magnitude at maximum as 6·8–7·0, or a range of 0·2 magnitude; and in most cases he gives figures of this kind; while the range is often much larger, as for o Ceti (No. 806), where he gives 1·7–5·0, a range of 3·3 magnitudes. In a few cases he gives a single value only, as for RS Libræ (No. 5511), where he sets down 8·2 simply: and in the subjoined table the range has in such cases been set down as 0·0; for though further observations may show an appreciable range, it will no doubt remain small.

3. The following table will be understood without further explanation; means have been taken for each ten stars, and it will be seen that for the extreme groups of ten the difference in range is quite marked, but is *in the opposite sense* to that suggested by Mr Brook.

4. It is not, however, impossible to frame an explanation of this table in terms of the hypothesis put forward. If the variations in the two hemispheres are related by some system of alternation—if, for instance, the total quantity of bright, flocculous matter on the star at maximum were always the same, but distributed for the greater part sometimes in one hemisphere and sometimes in the other—then the view enunciated by Mr Brook is the correct one.

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Range at Maximum of the Forty Variables tabulated on pages 351–2.

Large Values of α or "Polar" Stars.			Small Values of α or "Equatorial" Stars.		
α	Star's No.	Range at Max.	α	Star's No.	Range at Max.
+·25	6682	0·2	−·63	1582	0·7
+·22	8591	0·2	−·42	112	3·0
+·19	5511	0·0	−·35	2528	1·2
+·18	5795	1·2	−·34	5504	1·7
+·17	5887	0·5	−·34	4315	0·6
+·16	3637	0·0	−·31	2946	2·3
+·13	715	0·7	−·27	3825	2·2
+·12	107	1·0	−·27	6871	0·0
+·11	7659	0·9	−·27	7045	2·1
+·10	7779	1·8	−·27	243	0·8
	Mean .	. 0·65		Mean .	. 1·46
+·08	7609	1·6	−·26	5095	0·3
+·08	1717	1·1	−·25	806	3·3
+·07	7577	1·0	−·23	2539	0·7
+·07	7754	1·3	−·22	4492	1·4
+·07	5338	0·9	−·22	3170	1·2
+·05	7428	2·7	−·22	6849	1·5
+·05	5190	1·4	−·20	2100	1·1
+·03	1855	1·3	−·20	5194	0·7
+·03	294	0·0	−·19	434	1·1
+·02	6905	1·0	−·19	976	0·7
	Mean .	. 1·23		Mean .	. 1·20

Viewing the star equatorially, we should get the combined brightness of both hemispheres, which would be nearly the same; viewing the star polewards, we should get the full effect of the alternation between hemispheres.

5. Suppose, however, that the variations in the two hemispheres are independent of each other: or, if related, related on the principle of sympathy rather than that of alternation. In either case we might have them both bright (at maximum) or both faint (at maximum) together; and the range for equatorial view would not be any smaller than for polar view. But it would not, in the long run, be greater. Within a limited period it might seem to be greater, because one hemisphere might be regular for a limited period: and if the star were seen poleward the maxima

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would resemble each other, whereas if seen equatorially the irregularities in the other hemisphere would come in. The problem is very similar to the well-known problem of bimetallism.

6. There is, however, in our problem a factor not represented in that of bimetallism. Increased activity may mean the production of increased clouds of absorbing Corona, and the effect of this on the maximum might be different in different aspects. It would be unprofitable to speculate on the importance of this unknown factor in the present state of our knowledge. It seems better simply to call attention to the above fact. It is, on the face of it, unfavourable to the hypothesis put forward: but a direct contradiction is more satisfactory than a fact which goes neither one way nor the other, since there is always the possibility that a simple inversion of some kind has been overlooked.

Elements of the Variable Star RV Andromedæ. R.A. = $2^h\ 4^m\ 34^s$, Decl. = $+48°\ 27'·6$ (1900). By A. Stanley Williams.

A period of 182 days was suggested for this variable star in 1904 by the writer, from a comparison of a single visually-observed minimum in January of that year with some earlier photographic observations.* From the observations made here last year, combined with two maxima and two minima observed by Professor A. A. Nijland at Utrecht,† the following much more satisfactory elements of variation have been derived:

$$\text{Maximum} = \left\{ \begin{array}{l} \text{1904 April 26} \\ \text{J.D. 2416597} \end{array} \right\} + 170^{\text{d}}{\cdot}2\ E$$

the interval M − *m* being 82 days.

The above period was derived from five observations of four maxima and seven observations of six minima, the periods resulting from the maxima and minima being respectively 172·2 days and 166·2 days. The observations of the minima were more numerous than those of the maxima, and extended over a longer interval of time; but the maxima were more sharply defined than the minima, and the observations also more accordant, so that double weight was given to the determination from the maxima.

Quite recently the dates of two additional maxima and two additional minima have been published by Nijland;‡ and those of two maxima and a minimum by Mr F. H. Seares, from observations made by Mr E. S. Haynes at the Laws Observatory.§ Table I. below contains the particulars of all the observed maxima, together with the computed dates according to the foregoing elements, and the differences O − C. Table II. gives the corre-

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* *A.N.*, No. 3944. † *A.N.*, No. 4116. ‡ *A.N.*, No. 4164.

§ *Bulletin No.* 10 *of the Laws Observatory*, p. 147. Seares derived a period of 169 days for the star.